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RULEMAKING ESTABLISHING ELECTRIC WEATHERIZATION STANDARDS	§ § §	PUBLIC UTILITY COMMISSION OF TEXAS

COMMENTS OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC

CenterPoint Energy Houston Electric, LLC ("CenterPoint Energy" or the "Company") is a transmission and distribution utility and appreciates the opportunity to submit these comments in response to Commission Staff's June 9, 2021 request for comments on questions concerning weather emergency preparedness. Emergency preparedness is a Company top priority. It is a cornerstone of a resilient and reliable electric grid. In these comments, CenterPoint Energy responds to the following Commission Staff question:

> To fulfill the requirements of Texas Utilities Code § 38.075(a), under what weather emergency conditions should the Commission require an electric cooperative, municipally owned utility, or transmission and distribution utility providing transmission service in the ERCOT power region to be able to operate its transmission facilities? At a minimum, please address standards for temperature, icing, wind, flooding, and drought conditions. For each, please address whether the standard should vary by region or by type of generation facility. Please provide any relevant support for your recommendations, including existing or proposed standards in other jurisdictions, or related studies.

Executive Summary

CenterPoint Energy takes into consideration a variety of weather-related factors, current industry accepted design standards - in accordance with NESC ANSI equipment - and other unique regional differences when it is planning, designing, and constructing its transmission system and facilities to serve its customers. The company also takes into consideration several factors when maintaining and operating its transmission system, but is constantly utilizing industry best practices or in some cases its own transmission system operational best practices to ensure that the transmission grid is able to operate in both normal operation conditions and to withstand extreme weather conditions that are unique to its region or service area. Many, if not all equipment and facilities are designed to nationally accepted

standards, and Texas should not adopt a state standard that is lower or out of sync with nationally recognized standards. Texas is a large, geographically diverse state, with diverse weather conditions and patterns. The ambient air temperature in West Texas is generally hot and dry, while in the Gulf Coast region it is generally hot and humid. The Commission, therefore, should strongly take into consideration a more regional approach to any standard or rule that it adopts for transmission equipment or facilities that are not already covered by a nationally accepted engineering and design standards, to avoid placing unnecessary costs on an electric utility or its customers.

Types of Weather Emergency Conditions

PURA § 38.075 requires the Commission to implement rules that "take into consideration weather predictions produced by the office of the state climatologist." Therefore, the "weather emergency conditions" under which the Commission should require transmission facilities to operate should take into consideration the latest weather trends identified by the Office of the Texas State Climatologist ("OTSC").[1] The latest report issued by the OTSC and available on its website is entitled *Assessment of Historic and Future Trends of Extreme Weather in Texas, 1900-2036* (Mar. 5, 2020).[2] The OTSC 2020 Report "addresses historical and future trends in extreme temperatures, extreme precipitation, severe thunderstorms, and hurricanes."[3] It also looks at the effects that these trends will have with respect to droughts, floods and wildfires.[4]

It projects a nearly double increase in the average number of days of extreme high temperatures (100+ °F) from 12 days per year between 2000 and 2018 to 21 days per year by 2036.[5] It also projects an

[1] The Website for the Texas State Climatologist is at https://climatexas.tamu.edu/index.html.

[2] Available at https://climatexas.tamu.edu/products/texas-extreme-weather-report/index.html (hereinafter referred to as the "OTSC 2020 Report").

[3] OTSC 2020 Report at 3.

[4] *Id.*

[5] *Id.* at 6.

extension to "the wildfire season in places where the fire season is presently constrained by low levels of aridity, such as eastern Texas."[6] Moreover, while extreme heat is projected to become more frequent and more severe, it projects that extreme cold is becoming less frequent and less severe (Winter Storm Uri notwithstanding).

The OTSC 2020 Report projects average extreme cold temperatures to rise from 20.8 °F between 2000 and 2018 to 24.1 °F by 2036 (stating, "extreme cold is an increasingly remote [risk]" in Texas).[7] The OTSC 2020 Report also projects a decrease in winter precipitation, including a decline in snow and freezing rain frequency.[8] This projection is largely due to the projected warming of extreme cold days discussed above.

The OTSC 2020 Report also projects increases in overall precipitation or rainfall over the next two decades and a 10%-15% increase in the risk of extreme rainfall events ("characterized in terms of the 100-year rainfall event, which is an amount of rain over a given duration that has a 1% chance of occurring in any given year") by 2036 compared to 2000-2018.[9] As a result of this increase in extreme rainfall events, the OTSC 2020 Report also projects a 10%-15% increase in the frequency of urban flooding by 2036 compared to 2000-2018.[10]

Finally, the OTSC 2020 Report projects an "increased risk of storm surge from hurricanes" due to rising sea levels coupled with "an expected increase in the intensity of very strong hurricanes," despite a

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[6] *Id.* at 26.

[7] *Id.* at 8.

[8] *Id.* at 21.

[9] *Id.* at 11-13.

[10] *Id.* at 19.

possible decrease "in hurricane frequency overall."[11] However, the report is not able to quantify either the increased hurricane intensity and storm surge risk or the decrease in hurricane frequency.[12]

For purposes of this Project, the Company believes the weather trends analyzed in the OTSC 2020 Report can be grouped into the following "weather emergency conditions": (1) high temperature conditions; (2) low temperature and freezing rain or ice conditions; (3) high wind and lightning conditions resulting from hurricanes and severe thunderstorms; (4) flood conditions resulting from extreme high precipitation and/or coastal storm surges; and (5) drought and wildfire conditions resulting from extreme high temperatures and/or extreme low precipitation.

Standards and Practices for Protecting Transmission Facilities in Weather Emergency Conditions

A. CenterPoint Energy Transmission System Standards and Practices in General

The design, construction and operation standards applicable to the continued operation of a utility's transmission facilities under extreme weather conditions should be based on an assessment of the industry standards in place at the time of their design and construction and consider the future likelihood and magnitude of extreme weather events in the geographic region in which the utility operates. Since each electric utility providing transmission service in the ERCOT region (the "ERCOT TDUs") operates in a different geographic region of the state with differing characteristics, or in some cases in multiple regions with differing characteristics, the likelihood and magnitude of certain extreme weather events may vary significantly for each of them. Adopting a single standard for all the ERCOT TDUs without regard to its costs and benefits for a particular region would be inefficient. The Company

[11] *Id.* at 25.

[12] The OTSC 2020 Report also looked at severe thunderstorms that can produce tornados and hail but claims lack of data to identify trends into the future for calculating the number tornados or hailstorms to expect. However, the report notes that the state should expect "an overall increase in the number of days capable of producing severe thunderstorms." *Id.* at 22.

therefore believes that any standards adopted in this project should be varied based on regional-specific characteristics, including trending weather patterns for the region.

The Company utilizes the latest edition of the National Electrical Safety Code ("NESC") as a minimum standard in the design, construction, and operation of its transmission facilities. The NESC is published by the Institute of Electrical and Electronics Engineers ("IEEE") and is recognized as ***the*** standard for the safe installation, operation, and maintenance of electric power utility systems in the U.S. It is updated every five years, and the latest update is the 2017 edition. The Company's particular standards and practices for ensuring the resiliency and reliability of its transmission facilities under different extreme weather conditions are described in more detail in the various reports it has filed with the Commission, including its Infrastructure Improvement annual reports filed pursuant to 16 Tex. Admin. Code (TAC) § 25.94,[13] its Storm Hardening Plan and annual reports filed pursuant to 16 TAC § 25.95,[14] and its Vegetation Management annual reports filed pursuant to 16 TAC § 25.96.[15] The Company has also implemented the following efforts to further harden its transmission infrastructure: (a) targeted expenditures for rebuilding transmission lines to meet the most recent NESC extreme wind loading requirements, rebuilding transmission line river crossings with monopole structures within floodways to improve damage resilience from flood waters, and retrofitting transmission lines with anti-galloping devices to avoid damage from icing conditions, (b) utilization of transmission planning design criteria that results in a system that can respond to contingency conditions, which often arise during severe weather, (c) utilization of transmission facility design criteria, including Grade B construction and anti-cascade, (d) incorporation of engineered transmission construction materials beyond standard wood pole construction, (e) transmission line inspection and rehabilitation program, and (f) emergency material reserves and vendor alliances.

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[13] *See Project for Submitting Reports on Infrastructure Improvement and Maintenance*, Project No. 38068.

[14] *See Reports of Storm Hardening*, Project No. 39339.

[15] *See Annual Vegetation Management Plans and Reports*, Project No. 41381.

CenterPoint Energy also maintains a hardened transmission system primary control center with redundant computer systems separated by firewalls. The transmission system control center provides the ability to monitor and remotely operate the Company's transmission network from a secure, storm-hardened facility, including the ability to dynamically rate transmission circuits and restore service to customers impacted by a storm through remote control of switching equipment. The Company also completed construction of a back-up transmission system control center in December 2015, in compliance with the North American Electric Reliability Corporation ("NERC") Reliability Standard EOP-008. The back-up transmission system control center is a storm hardened facility with redundant computer systems and can perform the same functions provided by the primary control center in the event the functionality of the primary control center is impaired or lost. In January 2016, the backup control center received certification from NERC/Texas Reliability Entity ("TRE") that the new facility met all requirements to operate the CenterPoint Energy transmission system independent of the primary control center.

B. CenterPoint Energy Standards and Practices for Transmission Facility Operations under High Temperature Conditions

The Company's transmission facilities are designed and constructed to meet temperature ratings based on American National Standards Institute ("ANSI") and IEEE standards, which are unique to each individual piece of transmission facility equipment. For example, all substation transformers are specified with reference to ANSI/IEEE C57.12.00, *Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers*. This standard specifies "usual service conditions" as an ambient temperature between -20 °C and 40 °C. Adherence to this standard is ensured through design reviews of every new transformer design that CenterPoint Energy accepts, as well as witnessing testing of the all autotransformers for its transmission system. Circuit breakers inside substations (12KV up to 345KV) are another example. All such circuit breakers are specified with reference to ANSI/IEEE C37.04, *Standard for Ratings and Requirements for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000V*. This standard specifies "usual service conditions" as an ambient temperature between -

30°C and 40°C. Adherence to this standard is ensured through design reviews and witness testing of new designs.

Since ambient air temperature also affects transmission line tension, CenterPoint Energy designs its transmission lines to have adequate electrical clearances and acceptable thermal aging rates for both conductors and connectors, at Company-specified maximum allowable conductor temperatures. Further, the Company builds its transmission facilities in accordance with the NESC minimum clearance requirements in place at the time of their construction and in compliance PURA § 38.004 and regularly inspects its transmission system for NESC compliance. The Company is also currently implementing static thermal ratings for overhead transmission lines. In operations, the Company adjusts the various static line ratings based on a real-time Maximum Houston Area Temperature.

Per section 3.10.8 of the ERCOT Nodal Protocols, ERCOT currently does not require dynamic ratings to be provided for transmission level equipment. However, ERCOT does use Dynamic Ratings, where available, in the Network Operations Model and the CRR Network Models if provided by a transmission service provider. CenterPoint Energy provides to ERCOT a dynamic normal, emergency and 15-minute rating for all overhead transmission lines based on the following assumptions: (1) Dynamic ratings shall not exceed 120% of the conductor (static) emergency rating; (2) High-temperature aluminum conductor (ACSS) shall not be dynamically rated above the static rating; (3) Overhead conductor 15-minute rating shall not be temperature-adjusted; and (4) Transmission terminal equipment except jumper and span shall not be dynamically rated.

CenterPoint Energy generates Dynamic Rating Tables for applicable Transmission elements within its footprint based on IEEE Std. 738-1993 equations. CenterPoint Energy dynamically rates transmission lines which are limited by conductors for which this rating variability can be estimated based on manufacturer data. As such, CenterPoint Energy does not dynamically rate transformers, transmission lines limited by substation equipment, and underground cable.

Houston's real-time average temperature is calculated based on data from the National Weather Service ("NWS") averaged together with temperatures from three geographically dispersed substations within the CenterPoint Energy footprint. This value is provided to ERCOT via Inter-Control Center Communications Protocol ("ICCP"). ERCOT calculates real-time dynamic ratings by interpolating the rating table using the telemetered real-time average temperature.

C. CenterPoint Energy Standards and Practices for Transmission Facility Operations under Low Temperature and Ice Conditions

See above discussion under "CenterPoint Energy Standards and Practices for Transmission Facility Operations under Extreme High Temperature Conditions" regarding equipment standards based on ambient air temperature ratings, both high and low temperatures. For ice conditions, CenterPoint Energy designs its transmission lines to the latest edition of the NESC, which is the industry standard for both ice and wind design in coastal and inland areas. As the code is updated every five years, CenterPoint Energy adopts the latest revisions into its design standards. The Company currently uses the NESC C2-2017 design requirements as basic design criteria values for overhead transmission lines. The Company's practice for designing all new transmission lines is to utilize extreme wind and ice loading requirements. For example, Article 250 of the NESC requires a minimum of 140 mile per hour ("mph") wind loading at the coastline of the CenterPoint Houston service area. CenterPoint Houston also incorporates anti-cascade design features in its transmission lines including line post insulators with fail-safe bases or load limiters, storm guys, dead ends in H-frame lines, and steel arms designed to fail before the structure fails.

CenterPoint Energy also utilizes engineered materials, such as concrete and steel, for building new transmission lines and upgrading existing lines, instead of natural materials such as wood. CenterPoint Energy's experience is that transmission-class wood poles can withstand hurricane force winds when designed and maintained properly; however, since the late 1980's the Company has been upgrading wood pole lines to meet electrical capacity requirements and replacing them with concrete or steel structures.

Although CenterPoint Energy's geographical location is designated as a "light" ice district loading, the Company designs its substation facilities for "medium" ice district loading. Anti-cascade design features are also included in the design of substation facilities. In addition, all new substation facilities are designed utilizing extreme wind and ice loading requirements.

D. CenterPoint Energy Standards and Practices for Transmission Facility Operations under High Wind and Lightning Conditions

The above discussion regarding CenterPoint Energy's standards and practices for transmission lines and substations under ice conditions is also applicable to high wind conditions. Moreover, CenterPoint Energy complies with IEEE Standards 998-1996: Guide for Direct Lightning Stroke Shielding of Substations for shielding and protection of substation equipment. The standard provides design guidelines and methods to minimize direct lightning strikes to equipment and bus work within substations. CenterPoint Energy also utilizes reclosing relays at its substations that automatically restore transmission and distribution circuits that experience an outage due to momentary short circuits, such as lightning strikes during thunderstorms. The Company also installs sectionalizing or automatic load rollover controls at the high-side of certain distribution substations, so that transmission connections to these substations can be maintained for partial loss of transmission connectivity. The purpose of the automatic roll-over protection scheme is to prevent loss of load at the transmission high-side of substations tapped to two different transmission circuits by automatically rolling the load from a circuit experiencing an outage to another energized circuit. CenterPoint Energy's transmission planning load flow analyses incorporate models that accurately represent its automatic load roll-over protection scheme.

CenterPoint Energy designs its substations, including the control cubicle, to withstand 140 mph wind. CenterPoint Energy's substation protection and control systems implement automatic fault detection, isolation, and restoration actions in response to disturbances on the transmission and distribution systems. The primary function is to preserve the integrity of the power network following a

fault by isolating the minimum number of customers. The equipment is also protected from damage, subsequently reducing total outage times experienced by customers. Relays are placed at substations throughout the system and employ various protection technologies and schemes to achieve speed, selectivity, and security in their actions. The network is evaluated on an ongoing basis by performing fault and coordination studies that incorporate line outage contingencies and major equipment outages that may occur because of inclement weather. The results of these studies are used with applicable criteria set by NERC, ERCOT, and the Company to determine if changes to the substation protection and control system design and relay set points are necessary to maintain optimum system performance.

CenterPoint Energy also has a comprehensive five-year cycle transmission line inspection and rehabilitation program that is coordinated with the transmission vegetation management program ("TVMP") to ensure that the integrity of existing transmission structures, wires, and rights-of-way are maintained. Twenty percent of the transmission system is ground inspected and maintained each year. Any line component or vegetation conditions identified that will likely cause a failure or a circuit outage within a critically short period of time are mitigated on an immediate corrective basis. Herbicides are applied to retard woody growth of fast-growing species. An annual helicopter patrol is performed to identify and remove any dead trees adjacent to the transmission corridor that are in danger of falling into the transmission lines during high winds and to identify any line component conditions that need to be mitigated on an immediate corrective basis. The TVMP is written to comply with applicable electrical codes and electric utility regulations regarding vegetation management, including but not limited to NESC and, for transmission lines at applicable voltages NERC Reliability Standard FAC-003-4. For consistency in meeting its objectives, the Company has adopted the NERC vegetation clearance methodology from FAC-003-4 for all its transmission line voltages, including 345kV, 138kV, and 69kV.

E. CenterPoint Energy Standards and Practices for Transmission Facility Operations under Flood Conditions

The Company's substations along the Gulf Coast that are considered key infrastructure to the reliability of the Company's transmission system based on risk assessments are candidates for storm hardening designs. The identified substations are designed to provide the capability to withstand hurricane type forces. In addition to NESC requirements, CenterPoint Energy's substation designs allow for the elevating of vital substation equipment to a level based on flood elevations from forecasting and modeling data from the National Hurricane Center, historical hurricane data, and the Federal Emergency Management Agency ("FEMA") Flood Insurance Study in order to protect the integrity of the identified substations that are susceptible to flooding due to storm surge from hurricanes. This data helps determine the potential storm surge in these areas. The substation control cubicles, which contain vital communications, control, and protection equipment, are considered for an increase in elevation above the potential storm surge. Other equipment susceptible to water damage, such as transformers, breakers, and pull boxes, may also be elevated on a case by case basis, depending on available space. Substation structures, including the control cubicle, are also designed to withstand hurricane strength winds to protect them from wind damage. In this regard, because of extensive flooding caused by Hurricane Harvey, the Company is currently making targeted expenditures for substation equipment to withstand flooding. This includes the elevation of substations, control cubicles and other substation equipment to avoid flood damage. The Company is also currently undertaking a program to rebuild transmission line river crossings with monopole structures within river floodways to improve damage resilience from river flood waters.

To ensure compliance with NESC line clearance standards, CenterPoint Energy collects light detection and ranging ("LIDAR") data from its transmission lines via a helicopter equipped with laser imaging and photography equipment. The helicopter flies about 300 feet above the Company's transmission lines to collect the data at a relatively slow rate (20-30 MPH). Each year the Company captures LIDAR data for roughly 20-25% of CenterPoint Energy's transmission lines. The Company's goal

is to capture the entire CenterPoint Energy transmission grid at least once in a 5-year cycle. The Company uses this data to verify if its assets meet the 2017 NESC clearance standards.

F. CenterPoint Energy Standards and Practices for Transmission Facility Operations under Drought and Wildfire Conditions

A robust vegetation management program protects transmission facilities from wildfires in drought conditions. See above discussion concerning the Company's transmission vegetation management program. Besides wildfires, drought conditions can also cause dust to accumulate on transmission line insulators, which the Company mitigates by periodic washing and other operational practices. During the 2011 drought, the Company started experiencing flashovers due to high salt contamination levels on its insulators in the southeast coastal region of its service territory due to the severe drought. With respect to transmission structures, CenterPoint Energy instituted a program to redesign the polymer insulators for the Gulf Coast region and replace the old insulators with the redesigned insulators during the Company's normal 5-year inspection cycle. The Company's experience with severe drought conditions in 2011 also led the Company to develop a Contamination Mitigation Program. The program was created utilizing interdepartmental and utility best practices. This includes an algorithmic calculation of the daily Wind Vector that is determined based upon weather data received from a third party. This model is used to predict the potential of high-level contamination conditions during a time of minimal rainfall and increased sea spray. Once a particular threshold is reached, an automated email is sent out to various stakeholders including Real Time Operations (RTO). RTO will initiate various levels of mitigation activities to field operations based upon these thresholds. CenterPoint Energy also uses corona inspections that utilize a specialized camera to detect electrical arcing on insulators due to high levels of contamination build-up on insulators. These inspections are performed during periods when lack of rain is experienced. The inspections can also be triggered by high levels in the calculated wind vector. This process is well documented and reviewed yearly within the Company to ensure an increased level of accountability under extreme drought conditions.

Standard Variations by Region or Type of Generation Facility

As discussed above, any standards adopted in this project should allow for variation based on region-specific characteristics, including trending weather patterns for the region. One standard for all utilities will not work. Many transmission facility standards are designed to be region-specific, particularly weather-related standards. Regional differences apply per NESC and ASCE maps as well as design criteria such as voltage criteria for single contingency based on regional differences of industrial areas versus rural. Applying the same flood protection, temperature, or any other weather-related standard to both coastal and inland arid regions of the state, for example, would be impractical. Therefore, transmission facility standards should be different for different regions of the state, based on the characteristics of each particular region.

Regarding whether different standards should apply to transmission facilities based on the types of generation units those facilities interconnect with, CenterPoint Energy's experience at this time does not warrant such different standards. CenterPoint Energy currently designs and constructs its transmission facilities the same way, whether it is interconnecting with a renewable generation unit or a nonrenewable generation unit. In some cases, the generators themselves may need to install different types of equipment, with associated different standards applying to such equipment, on their side of the point of interconnection based on the type of generation unit, but the Company's interconnecting transmission facilities are currently the same regardless of the type of generation unit.

CONCLUSION

CenterPoint Energy appreciates the opportunity to participate in this project and hopes the information provided in these comments is helpful. The Company is eager to provide any additional information to help the Commission develop appropriate rules and standards in this project.

Respectfully submitted,

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